

PATENT

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Claims:

1. A method for forming a nucleation layer and a bulk deposition layer on a substrate disposed in a processing chamber, said method comprising:
forming a refractory metal nucleation layer by serially exposing said substrate to first and second reactive gases; and
forming a bulk deposition layer on said nucleation layer by employing vapor deposition to bulk deposit a refractory metal contained in one of said first and second reactive gases.
2. The method as recited in claim 1 wherein said bulk deposition layer is deposited employing chemical vapor deposition.
3. The method as recited in claim 1 wherein said bulk deposition layer is deposited employing physical vapor deposition.
4. The method as recited in claim 1 wherein forming a nucleation layer further includes introducing a purge gas into the processing chamber after exposing said substrate to the first reactive gas and before exposing said substrate to said second reactive gas.
5. The method as recited in claim 1 wherein forming a nucleation layer further includes purging said processing chamber of said first reactive gas by pumping said processing chamber clear of all gases disposed therein before introducing said second reactive gas.
6. The method as recited in claim 1 wherein forming the refractory metal nucleation layer further includes purging said processing chamber of said first reactive gas by introducing a purge gas and subsequently pumping said processing chamber clear of all gases disposed therein before exposing said substrate to said second reactive gas.

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7. The method as recited in claim 1 wherein forming the refractory metal nucleation layer includes forming alternating layers of a boron-containing compound and a refractory metal compound onto said substrate.
8. The method as recited in claim 7 wherein the boron-containing compound is diborane B₂H₆.
9. The method as recited in claim 7 further including subjecting said substrate to a purge gas following formation of each of said alternating layers.
10. A method for forming a nucleation layer and a bulk deposition layer on a substrate, said method comprising:
 - serially exposing said substrate to first and second reactive gases, wherein said second reactive gas comprises a refractory metal selected from the group consisting of titanium (Ti) and tungsten (W), while said substrate is disposed in a processing chamber, to form a nucleation layer;
 - removing from said processing chamber said first reactive gas before exposing said substrate to said second reactive gas;
 - forming said layer adjacent to said nucleation layer by chemical vapor deposition while said substrate is disposed in said processing chamber by concurrently exposing said nucleation layer to said second reactive gas and a reducing agent.
11. The method of claim 10 wherein said reducing agent comprises silane.
12. The method of claim 11 wherein said refractory metal is tungsten (W).
13. The method of claim 10 wherein removing from said processing chamber further includes introducing a purge gas into said processing chamber and pumping said processing chamber clear of all gases present therein.
14. The method as recited in claim 10 wherein said nucleation layer has a thickness in the range of 10 to 100 Å.